Surveillance of Real Time Video Streams by using Hill Climbing Algorithm

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ABSTRACT
Data mining is the application of statistical techniques and programmatic algorithms to discover previously unnoticed relationships within the data. With the development of software and hardware, video surveillance systems have been not only widely used in the security realm, but also in daily life in hotels, supermarkets, banks, schools and so on. These applications are used for real-time monitoring or checking later. Now video surveillance systems have lower intelligence and required people to operate them. So, it is urgent to extract video content features, and semantic information and there is a need for some kinds of models due to the increasing demands of intelligence. According to the applications of data mining, it is able find out implicit, useful and knowledge from a large number of video data. Then they can help us understand video solutions automatically, improve intelligence of surveillance applications and make decisions.

Keywords
Video Surveillance, Data mining, pattern recognition, real-time monitoring.

1. INTRODUCTION
Video Surveillance is the process monitoring of the behavior activities, changing information of people for the purpose of managing, directing, influencing or protecting of unusual events [7]. The interest of both research and industrial worlds have been captured by development video of surveillance systems due to abnormal instances in society, industries and the increasing security and safety concerns. But it is impossible for human being to monitor the videos twenty four hours. So there is need of such a system which will be useful for real time automatic object identification, object movement pattern recognition, modeling and detection of normal and abnormal (interesting) events, and event pattern recognition. Here the hill climbing based segmentation for clustering the similar segments is used. The reason behind using the hill climbing algorithms is that it is more effective for the real time system and produced the result in the limited time which is a prime requirement of real time system. In the real time environment there is a limited time to find out the abnormal or unusual events this requirement is more efficiently fulfill by the hill climbing clustering algorithm.

2. REVIEW OF LITERATURE
Most of the researchers did the work on the video streams to find out the abnormal activity. Initially researcher's focuses on color feature in order to performed clustering and determine unusual activity [3]. But previously single stationary camera were used which has it many more limitations and only able to focus on the single activity at stationary places. Later on moving camera at the stationary places has been used which has cover large geographical area but still having some lacunas. Previously the focus was on the fundamental classification technique which was unable to produce the accurate results. Each technique which was developed has it merits and demerits. But monitoring of the videos at real time and find out the abnormal activities is really a challenging work for the techno savvy researcher. In the recent years there were a many more clustering algorithms are used such as k- means algorithm, Dynamic Oriented graph, Markow Model but still need a new technique in order to produce the richer output [5].

3. PROPOSE SYSTEM
The input to the propose system is real time video footage at public place, malls etc. The system follows the target area detection and then video segmentation in order to perform clustering on the frames and to find out the abnormal events.

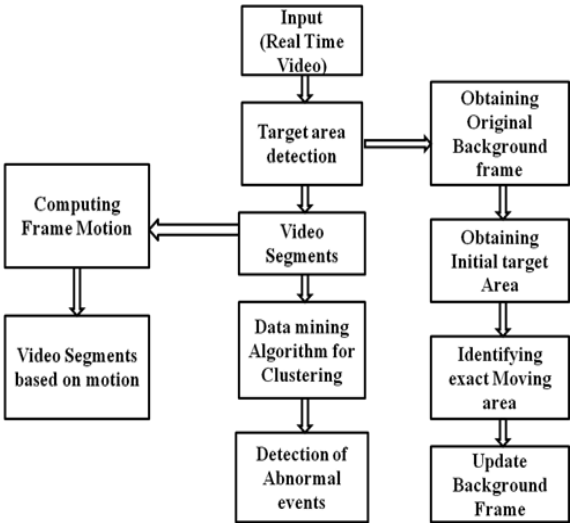

Fig.1: System Architecture.

The proposed system include three important module first one is Target area detection second one is video segmentation and third one is clustering algorithm which is used to cluster the similar segment. The detail explanation is given below.

3.1 Target area detection
It is very important to obtain the exact target area for clustering surveillance video segments.

3.1.1. Background Subtraction

Background Subtraction can obtain two binary images of the video frame and use different gray levels to divide the target and background area of the video frame.

3.1.2 Symmetrical Differencing

Symmetrical Differencing can detect the profile of a moving target occurring in the middle of the frame and reduce the background caused by movement. It can capture accurate moving targets with the combination of the two methods. Ones the moving area is detected there is need to preprocess the moving are in order to find out the abnormal activity.

Following figure shows how the moving are has been detected by using background subtraction method.

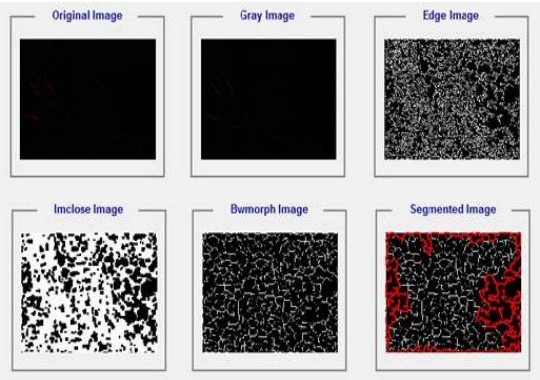

Fig.2: Detection of moving object boundaries

3.2 Video Segmentation

Surveillance video is always stable and consecutive, and the camera works 24-hour per day. Average motion of a video segment will change when objects move faster/slower or the amounts of objects increase/reduce. Then, it divides the surveillance video into several segments depending on the amount of motion.

3.2.1 Frame Motion

Frame motion is computed in following way; motion reflects the changes of target areas in Surveillance video. Frame motion is defined as pixels in the moving area per pixels in total frame.

3.2.2. Total Motion

Total Motion (TM) in each video segment is considered as the accumulated sum of pixels of all frames. It depends on the number of pixels and the length of a segment. A TM of a long segment with little motion can be equivalent to a TM of short segment with a lot of motions.

3.2.3 Average Motion

To distinguish this Average Motion (AM) to measure the condition of a segment is used. Video segment based on motion include different segment that have a different AM and compile different motion of the frames by probability and statistic.

4. CLUSTERING ALGORITHM

Ones the method extract the motion feature and location features of the frames, it can able to generate the total motion matrix and average motion matrix and then apply the hill climbing clustering algorithm in order to group the similar activity. The stepwise details of the algorithm are as given below.

Algorithm: Hill climbing based segmentation

1 Compute the Average Motion Matrix of the Segment.

2 Start at a non-zero bin of the Average Motion Matrix and make uphill moves until reaching a peak as follows:

2.1 Compare the number of pixels of the current Average Motion Matrix bin with the number of pixels of the neighboring (left and right) bins.

2.2 If the neighboring bins have different numbers of pixels, the algorithm makes an uphill move towards the neighboring bin with larger number of pixels.

2.3 If the immediate neighboring bins have the same numbers of pixels, the algorithm checks the next neighboring bins, and so on, until two neighboring bins with different numbers of pixels are found. Then, an uphill move is made towards the bin with larger number of pixels.

2.4 The uphill climbing is continued (repeat steps 2.1-2.3) until reaching a bin from where there is no possible uphill movement. That is the case when the neighboring bins have smaller numbers of pixels than the current bin. Hence, the current bin is identified as a peak (local maximum).

2.5 If no uphill move is done, the stopping bin is identified as a peak of a hill, and all bins leading to this peak are associated with it.

3. Select another unclimbed bin as a starting bin and perform step 2 to find another peak.

This step is continued until all non-zero bins of the Average Motion Matrix are climbed (associated with a peak).

4. The identified peaks represent the initial number of clusters of the input Segment and thus these peaks are saved.

5. Neighboring pixels that lead to the same peak are grouped together. Although, it used a global Average Motion Matrix to find the peaks, step 5 takes into account the spatial information of the pixels when forming the segments, i.e. only spatially close (neighboring) pixels that lead to the same peak are grouped into one segment. Finally, neighboring pixels that lead to the same peak are grouped together, that is associating every pixel with one of the identified peaks. Thus forming the clusters of the input Segment.

The following diagram shows how hill climbing algorithm is used to performed the clustering on the two dimensional matrices.

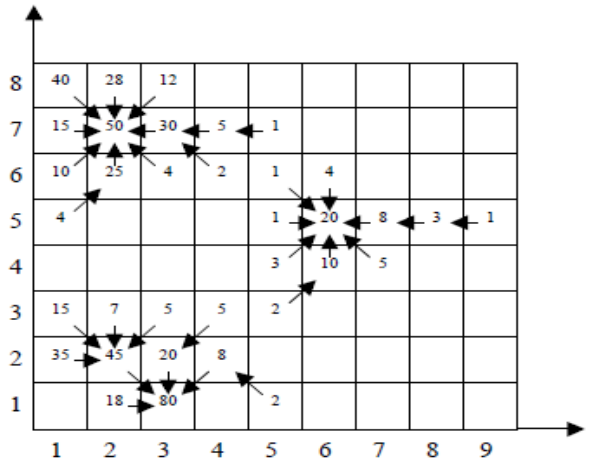

Fig.3: Cluster formation in feature vector.

The number in each cell represents a hypothetical count for the feature vectors captured by that cell. By examining the counts of the 8-neighbors of a particular cell, a link is established between that cell and the closest cell having the largest count in the neighborhood. At the end of the link assignment, each cell is linked to one parent cell, but can be parent of more than one cell. A peak is defined as being a cell with the largest density in the neighborhood, i.e. a cell with no parent. A peak and all the cells that are linked to it are taken as a distinct cluster representing a mode in the histogram. Once the clusters are found, the windows associated with features grouped in the same cluster are tagged as belonging to the same category

5. CONCLUSION

This paper proposes a new data mining algorithm, which is used in surveillance video of stationary places. Thus hill climbing algorithms will effectively find out the abnormal activities. It includes target area detection, video segmentation and clustering. Hill climbing can often produce a better result than other algorithms when the amount of time available to perform a search is limited, such as with real-time systems. It can return a valid solution even if it's interrupted at any time before it ends. Hill climbing is noise tolerant so far as the real time environment is concern.

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